Classification of Living Organisms

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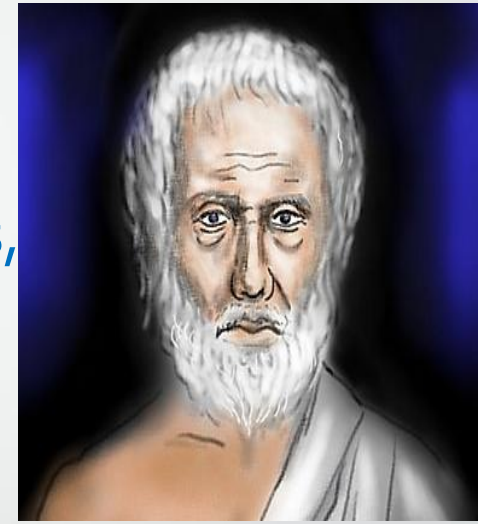
History

Aristotle (384-322 BC)

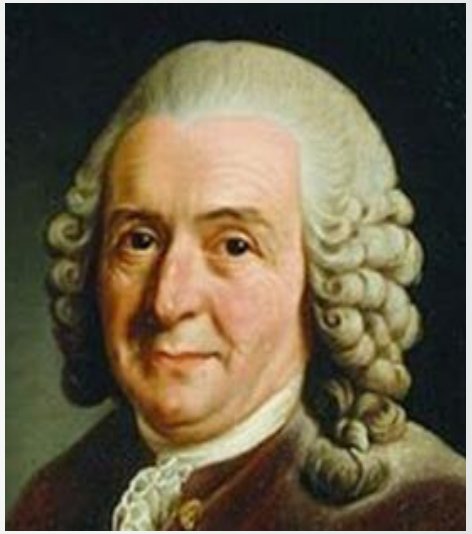
- Animals can be classified according to their way of living, actions, habits and body parts.
- He is considered as the *'father of biological classification'.*



John Ray (1627 - 1705)

- Divided animals into those with blood and those without blood.
- He also classified animals based on gills, lungs, claws, teeth and other structures.

History



Linnaeus (1707 - 1778)

- The *father of taxonomy.*
- He first introduced the hierarchic system, both in animal and plant kingdoms.
- He followed four categories namely **class**, **order**, **genus**, **species** for the animal world.
- His greatest contribution to taxonomy was the use of ***binomial nomenclature*** for all species of animals and plants.

History

Michael Adanson (1727 - 1806)

- Develop a new type of taxonomy called *'Numerical Taxonomy'*.

Lamarck (1744 - 1829)

- He arranged animals according to **evolution**.
- Beginning of the use of *phylogeny in systematics*.

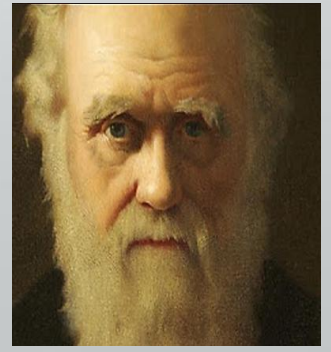
History

Cuvier (1769 - 1832)

- insisted that **extinct fossil forms** should be included in the table of classification.
- He divided animals into four branches *Vertebrata*, *Mollusca*, *Articulata* and *Radiata.*

Charles Darwin in 1859

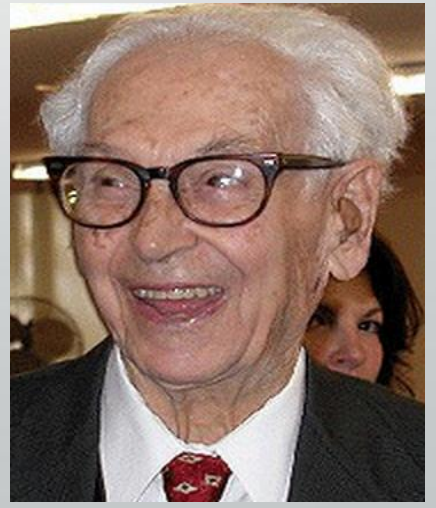
- His famous work '***Origin of species***'**.**
- The new evolutionary concept of Darwin encouraged taxonomists and gave meaning to their classifying activities.
- A large number of species were discovered and described.



History

Ernst Mayr (1942)

- He considered species as "groups of interbreeding natural populations".
- The taxonomists were forced to accept species as a 'population'.
- The taxonomist started moving from the laboratory to the field.
- In addition to morphological characters, other characters were studied such as behavior, sound, ecology, genetics, zoogeography, physiology and biochemistry.
- Thus taxonomy was transformed into '***biological taxonomy***'.



Hierarchic System of Classification

- Taxonomy from Ancient Greek: [**τάξις (taxis)** = arrangement, and **νομία (nomia)** = method]
- Grouping organisms according to their structural similarities.
- In this system the various groups are called **taxa** (singular: taxon).
- This arrangement of groups from the largest to the smallest is called ***hierarchic system of classification*** that has many uses for:
  - ✓ Sorting organisms in ranks
  - ✓ Identifying new organisms by finding out which group they fit.
  - ✓ It is easier to study organisms when they are sorted in groups.

Hierarchic System of Classification

- The largest group is the **kingdom**.
- Each kingdom divided into **phyla** (singular phylum).
- Each phylum subdivided into

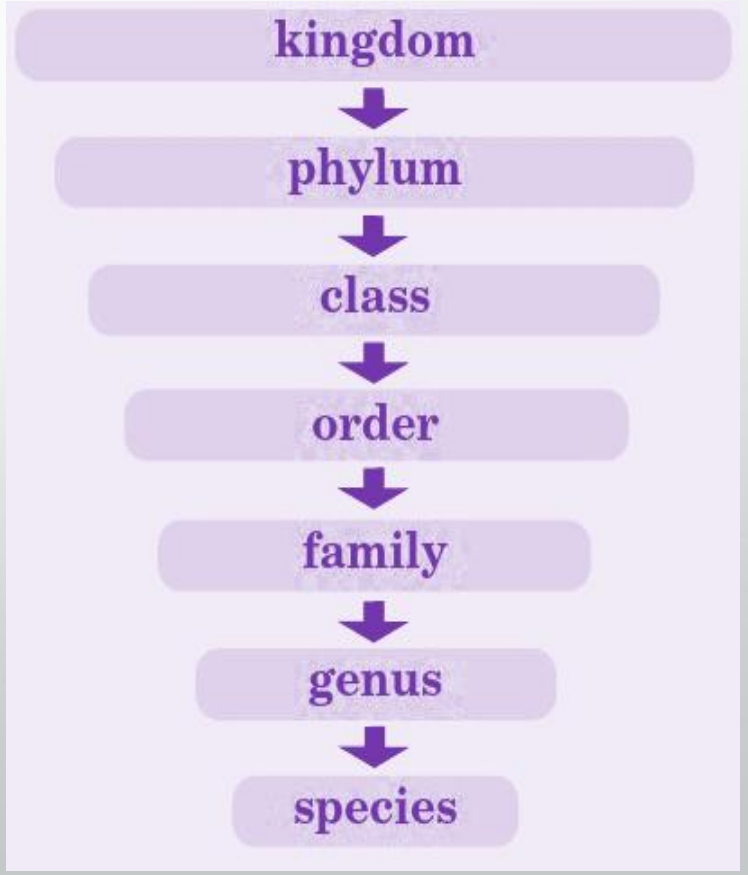
  classes

  orders

  families

  genera

  species.



Hierarchical system of taxonomy for wise man

Kingdom ..... **Animalia** (all animals)

Phylum ..... **Chordata** (all animals with a backbone)

Class ..... **Mammalian** (all animals have hair)

Order ..... **Primate** (all mammals with hands and feet)

Family ..... **Hominidae** (apes, primitive humans and modern humans)

Genus ..... ***Homo*** (primitive humans and modern humans only)

Species ..... ***sapiens*** (modern humans only)

The binomial system

- According to Linnaeus a Species is specified by the combination of both its specific and generic names.
- The genus and species names are always either *italicized* or underlined.
- The genus name capitalized and the species name given in lower case.
- Thus the Scientific **binomial** for wise man is represented either:

  (***Homo sapiens) or***

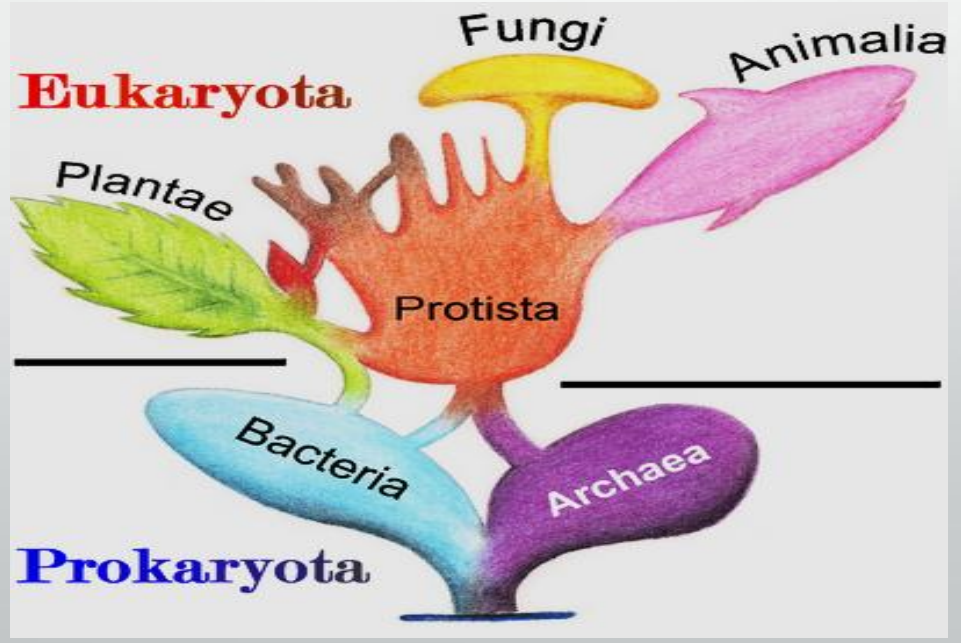
  (**Homo sapiens**)

The concept of species

- Species is fundamental unit of life on Earth & is smallest group of organisms
- Species defined as a *group of organisms with similar features, and these organisms are capable of breeding and produce fertile offspring.*
- Horses and donkeys belong to the same kingdom, phylum, class, order, family as well as genus but they are from different species.
- If a donkey and horse happen to breed, they produce infertile offspring called a ***mule***.

The concept of Kingdom

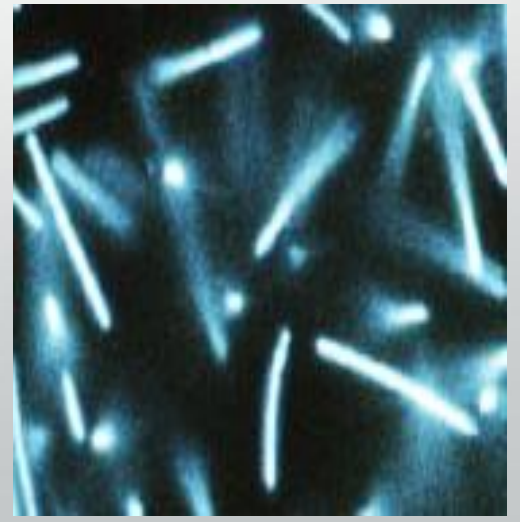
- Kingdom is the highest rank in the biological taxonomy of all organisms.
- Until 20th century, all living things classified as ***plant*** or ***animal***.
- By 1970s, Five Kingdoms [one prokaryotic bacteria + four eukaryotic kingdoms (plants, animals, fungi, & protists)].
- Now, every living thing comes under one of 6 kingdoms:



1. Archae bacteria Kingdom

All members of this kingdom are:

- Single-celled organisms (Unicellular)
- Prokaryotes (don't have true nucleus)
- Autotrophs (don't eat other organisms)
- Ex: ***Methanogen bacteria*** (produce methane gas).



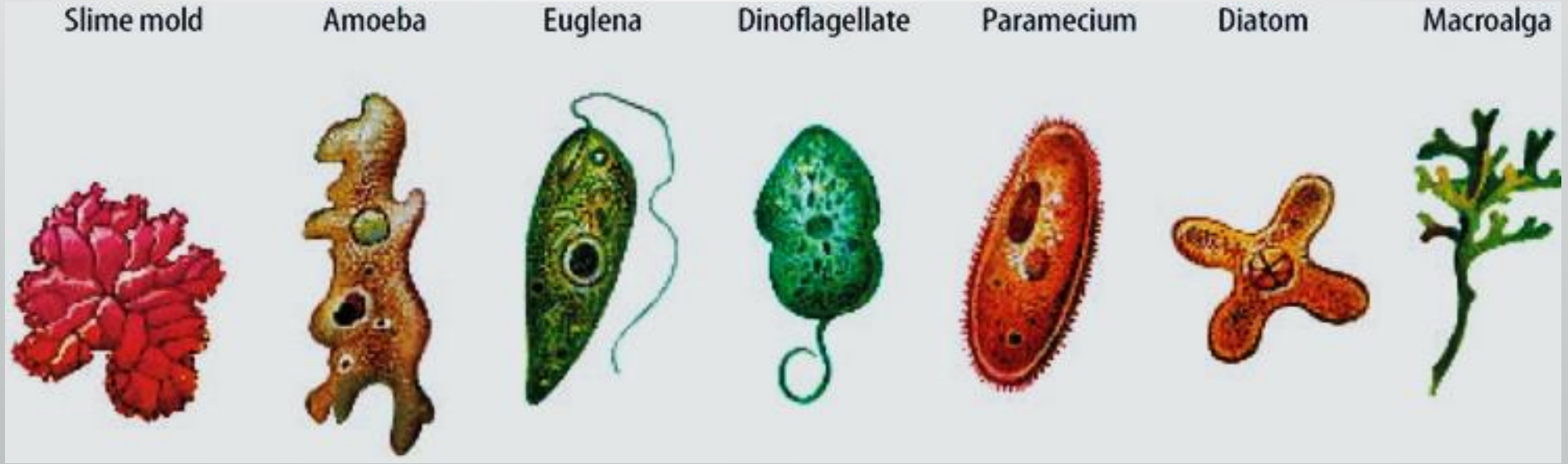
2. Eubacteria Kingdom

Members of this kingdom are:

- Single-celled organisms
- Prokaryotes
- Some of them can't make their food ***(heterotrophs)***
- Others make their own food (autotrophs) by getting energy from:
  - ✓ Sun light ***(photosynthetic autotrophs)***
  - ✓ Breakdown inorganic sulfur & nitrogen compounds ***(chemosynthetic autotrophs).***

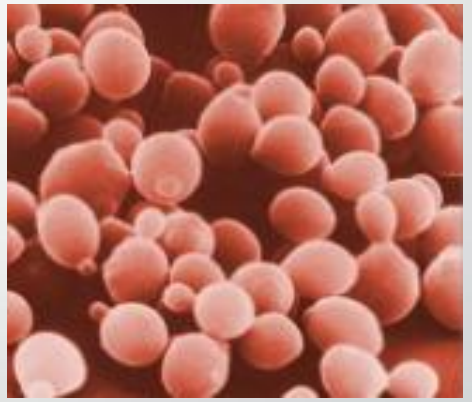
3. Protista kingdom

- They are all eukaryotes
- They could be multicellular & unicellular
- Some of them are microscopic and others are very large.
- Protista contain both heterotrophs & autotrophs.
- They include ***Protozoans***, ***Algae***, and ***Molds***.



4. Fungi kingdom

- They are all eukaryotes and
- They are all heterotrophs (either parasitic or mutualistic)
- They have cell wall made of chitin & glycan
- Most of them are multicellular.
- Examples include mushroom, yeast.



5. Plantae Kingdom

- Plants are multicellular
- They have a cell wall made of cellulose
- All plants are photosynthetic autotrophs
- All are eukaryotes
- Examples: trees, herbs, grasses.

6. Animalia Kingdom

- All animals are Eukaryotes
- Without cell wall
- Highly diverse in their:
  - ✓ Structure
  - ✓ Size
  - ✓ Behavior
  - ✓ Mobility
  - ✓ The way that getting food.

Methods of grouping animals

- Aristotle dividing the Animal kingdom into **Invertebrata** & **Vertebrata**.
- Then animals grouped into **Protozoans** (Unicellular) & **Metazoans** (multicellular).
- Finally animals are grouped under following three assemblages:

A. Protozoa - single celled animals

B. Parazoa - Multicellular without tissue grade.

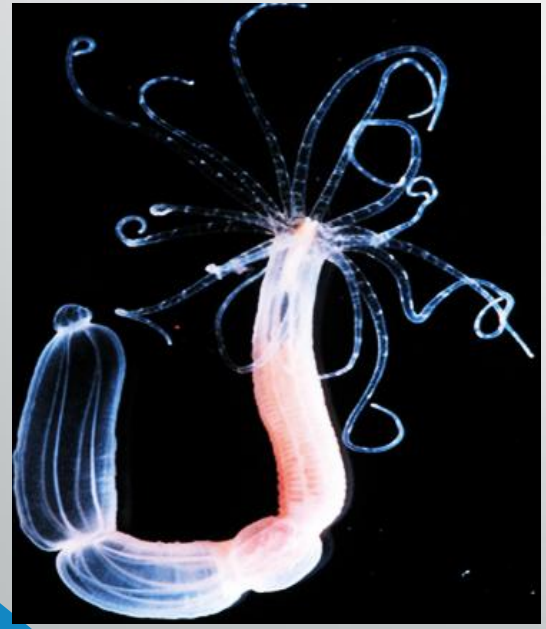
C. Eumetazoa - Multicellular with tissue grade

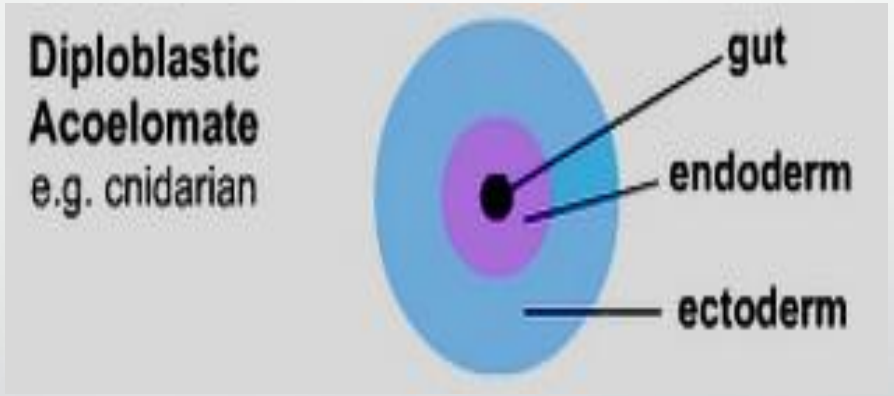
C. Eumetazoa

Multicellular with tissue grade is subdivided further into two groups:

1. Diploblastic animals

having ectoderm and endoderm as two layers in the body wall. Ex: Cnidarian





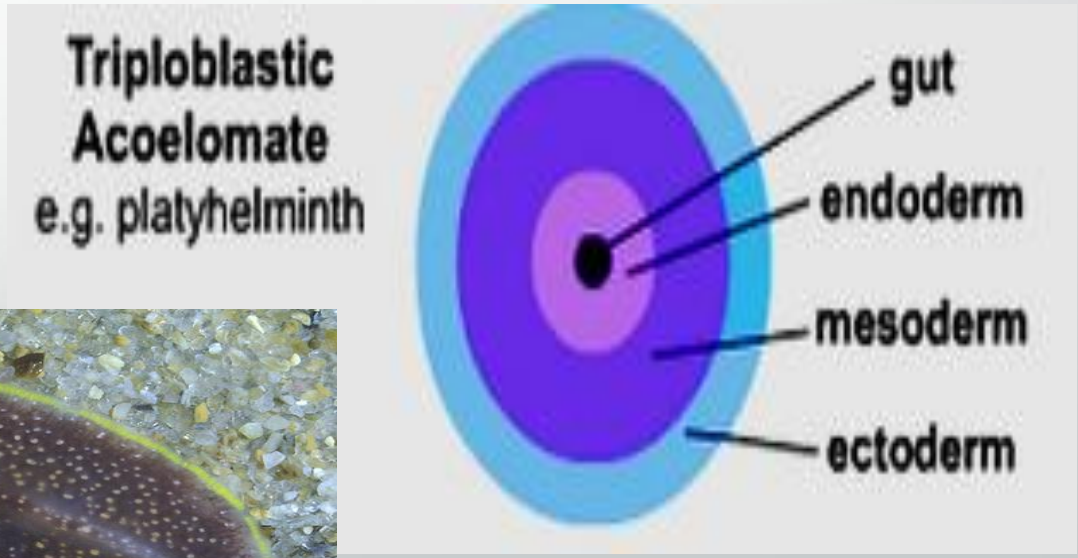
C. Eumetazoa

2. Triploblastic animals

- having ectoderm, mesoderm and endoderm as three layers in the body wall.
- Further divided into three groups based on the presence or absence of body cavity called (**coelom)**:

a) Acoelomata - no coelom

Ex : Platyhelminthes (flat worms)

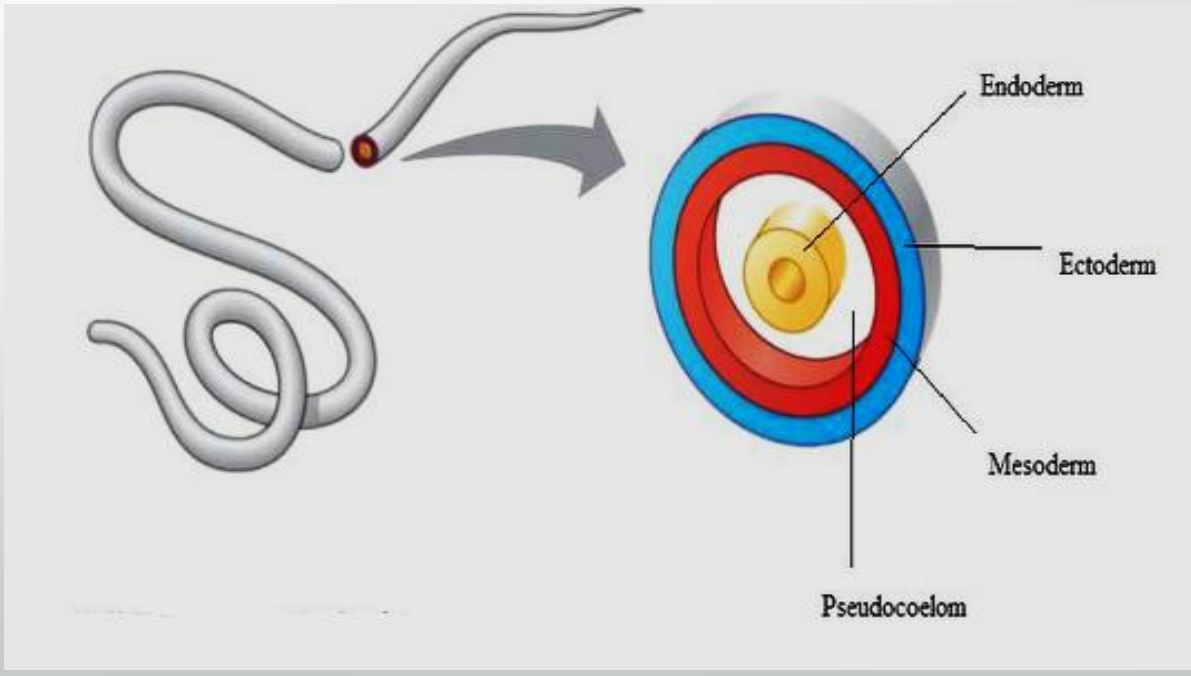


C. Eumetazoa

2. Triploblastic animals

b) Pseudocoelomata – with a false coelom.

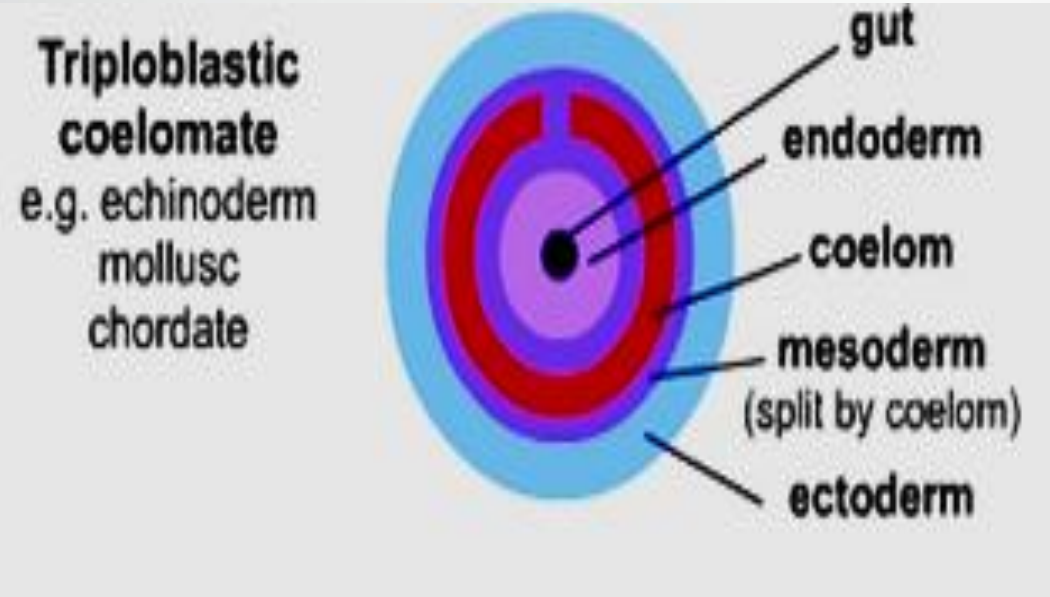
Ex : Nematoda (round worms)



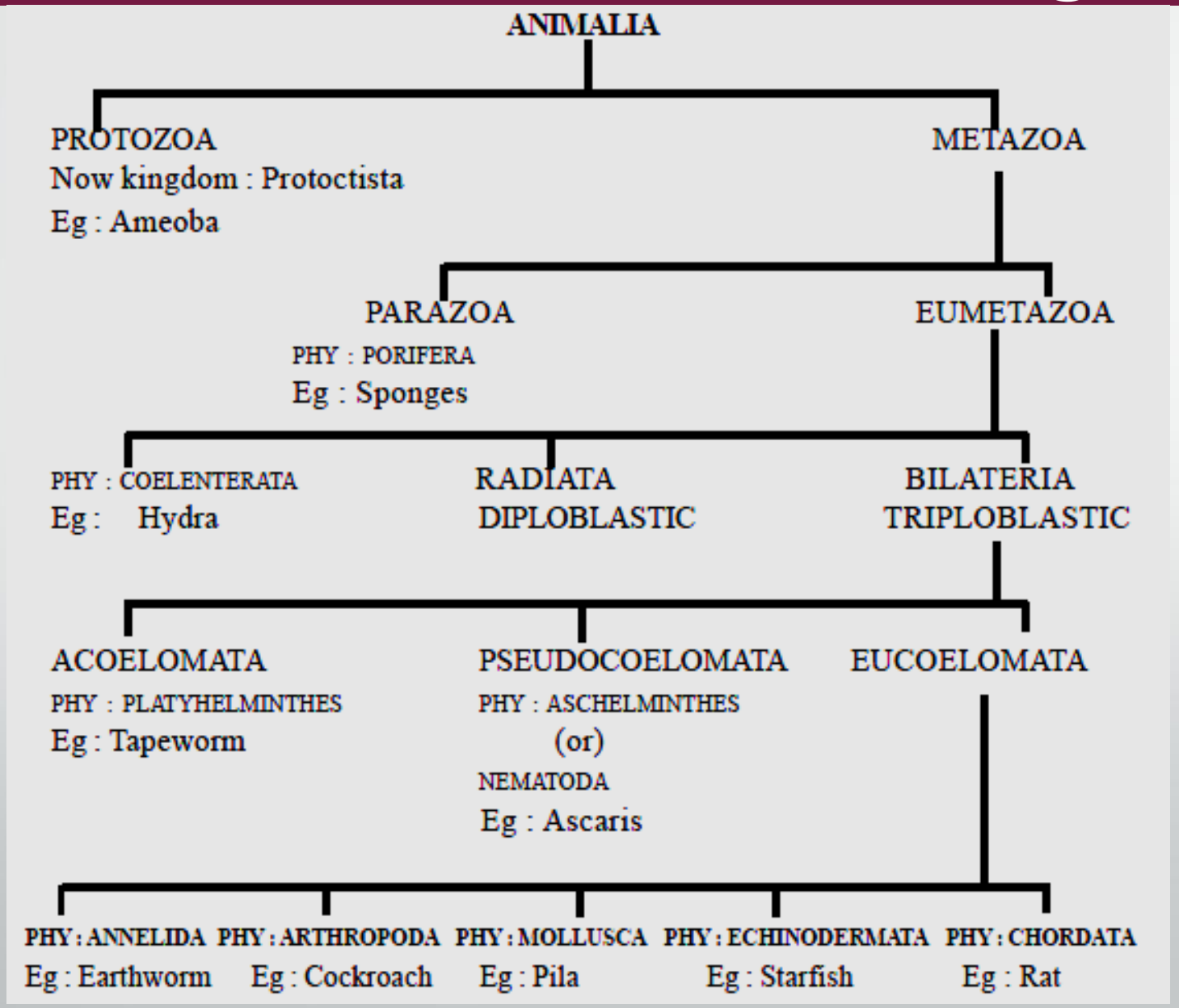
C. Eumetazoa

2. Triploblastic animals

c) Coelomata - with a true coelom, include all the rest of animals, such as Annelida, Echinodermata, Mollusca, Chordata…etc.



Outline Classification of Animal Kingdom




THANK YOU